Preliminary Transmission Plans for Meeting 33% Renewable Portfolio Standard Goals

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California ISO
Your Link to Power

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Transmission Issues for 33 Percent Renewables by 2020
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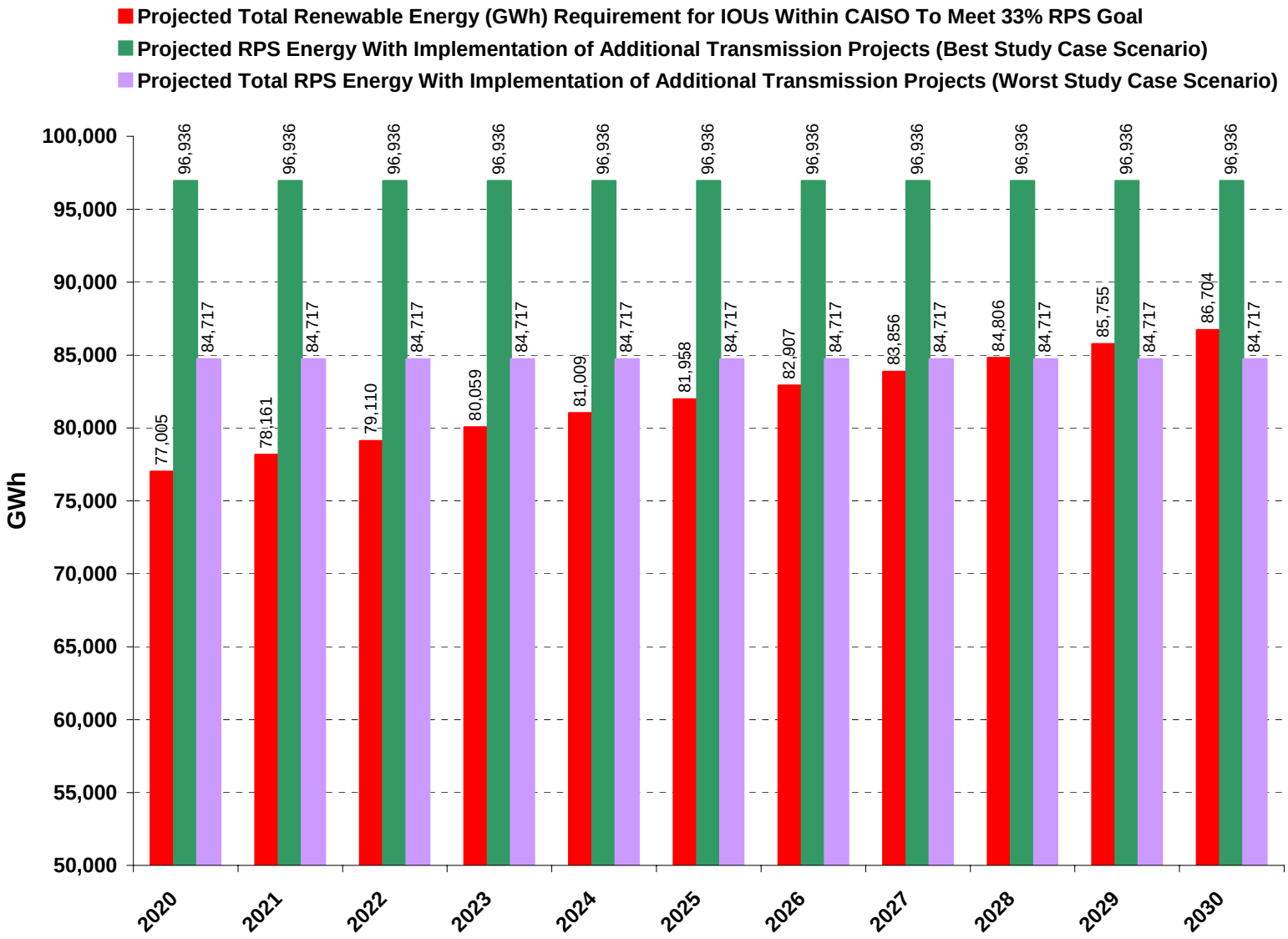
These Conceptual RPS Transmission Plans are intended to support RETI.

- Contribute to the Renewable Energy Transmission Initiative (RETI)
- Identify possible need for additional transmission to meet California's 33% Renewable Portfolio Standard (RPS)
- Accelerate RETI transition from competitive renewable energy zone designations to conceptual transmission identification
- Enable transition to Phase 2 studies

The analysis addresses these key issues.

- What is the estimated magnitude of the transmission capacity additions for the IOUs to to meet California's 33% RPS?
- What are the potential RPS compliance results with the connection of different renewable resource mix (i.e., solar and wind vs. solar, wind and geothermal)?

Transmission in addition to Tehachapi and Sunrise is needed to meet a 33% RPS goal.



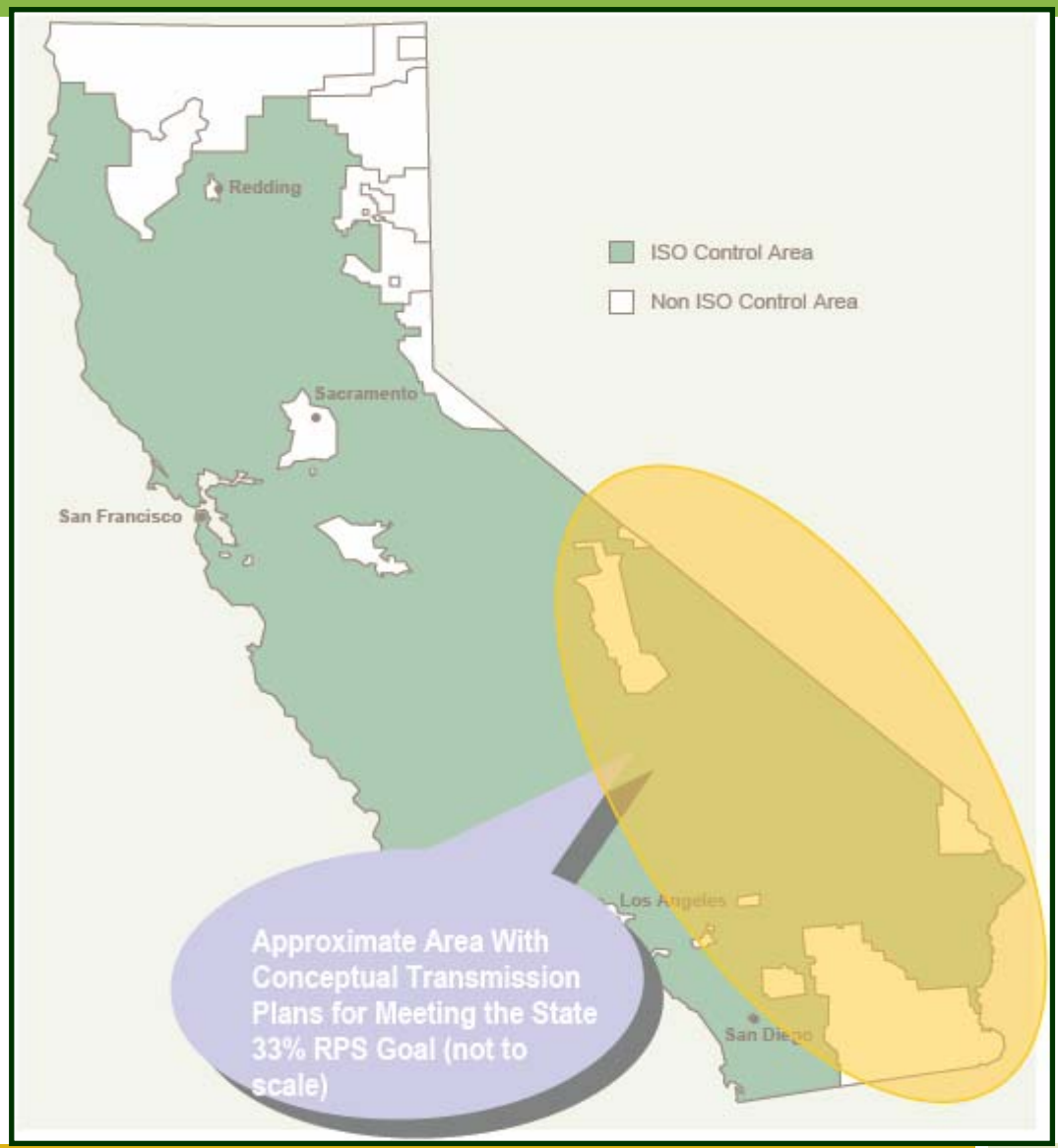
Transmission in addition to Tehachapi and Sunrise is needed to meet a 33% RPS goal.

- Study identifies six 500 kV transmission lines needed to meet 33% RPS
- Best case scenario: 33% RPS met beyond 2030

  (Best case scenario connects some geothermal generation to preliminary transmission plans)
- Worst case scenario: 33% RPS met through 2028

  (Worst case scenario connects more solar and no geothermal generation to preliminary transmission plans)

The Conceptual Transmission Plans for Meeting the State's 33% RPS Goal Approximate Areas of Conceptual RPS Transmission Plans are in Southern California.



These are the Conceptual Transmission Plans for Meeting the State's 33% RPS Goal Approximate Areas & Planning Level Cost Estimates.

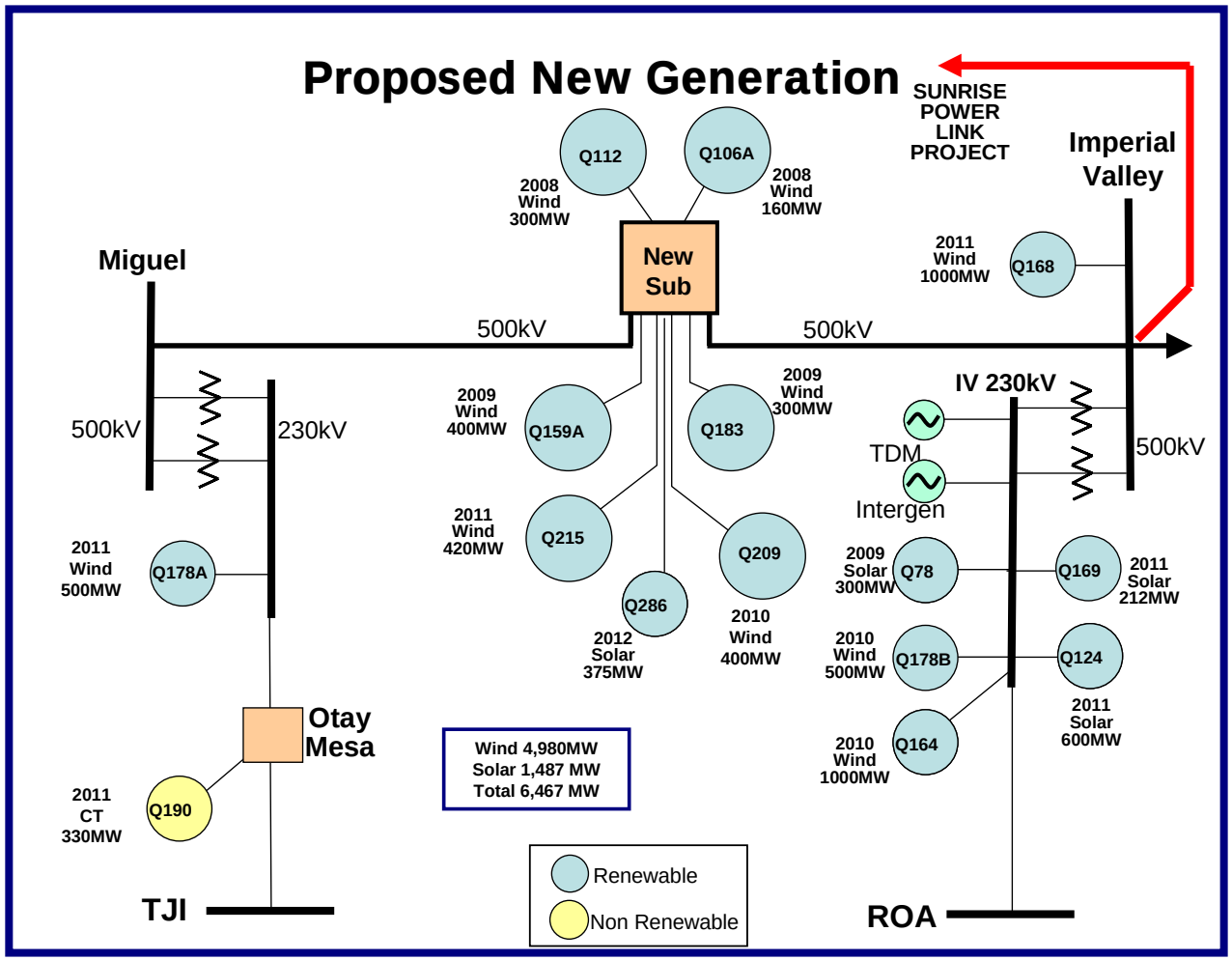
Item Number	Transmission Plan Description	Estimated Transmission Capacity (MW)	Renewable Resource Assumptions	Estimated Energy (GWh)	Planning Level Cost Estimates (+/- 50% Accuracy) ($ Million)
1	Plan A.1: Construct New 500kV Substation and Loop Into Existing Southwest Powerlink Line (SWPL)	1,700 (Existing)	1,051 MW Wind	3,407	$300 M
2	Plan A.2: Expand Midpoint Substation and Construct Third Midpoint – Devers and New Devers – Mira Loma (or Valley) 500kV:	2,400	2,400 MW Solar 500 MW Wind (Use diversity to accommodate)	7,600	$1,500 M
3	Plan A.3: Upgrade WECC Path 42 (SCE – IID) and/or Construct New 500kV LCRIF Line Connecting Additional Potential Geothermal Resources In Salton Sea to Devers Substation	1,800	1,800 MW Geothermal	14,200	$800 M
4	Plan A.4: Central California Clean Energy Transmission Project (C3ETP) Connection of Renewable Resources in the Kern County Are	1,250	1,250 MW Wind	4,052	$1,600 M
5	Plan A.5: Converting Pisgah – Lugo 230kV Lines to 500kV Double Circuit Tower Line (DCTL) OR +/- 500kV DC Line And Adding A New Fourth Lugo – Rancho Vista (or Mira Loma) 500kV Line	1,200	1,200 MW Solar	2,838 – 9,500	$1,600 M
6	Plan A.6: Construct A New 500kV LCRIF Line to Kramer Jct. and Lugo Substation	1,200	1,200 MW Wind	6,700	$650 M
Total		9,550 MW	9,401 MW	38,800 - 45,500 GWh	$6,450 M Or $6.5 B

Resources in Renewable Rich Areas

	Resource Type And Locations	Estimated Total Developable Capacity (MW)	Resource Assumptions for Tehachapi Transmission and Sunrise Powerlink Projects (MW)
1	Wind – Tehachapi Area	8,035	3,700 – 4,500 (Tehachapi)
2	Wind – Imperial Valley	1,051	1,000 (See Scenario 1, Chapter I)
3	Wind – Eastern Mojave	1,994	0
4	Wind – Western Mojave	3,810	0
5	Solar – Imperial County	220,244	1,000 (See Scenario 3, Chapter I)
6	Solar – San Bernardino County	381,159	0
7	Solar – Riverside County	127,161	0
8	Geothermal – Imperial County (Most Likely Development)	2,488 (Existing 523)	1,000 (See Scenario 2, Chapter I)
9	Geothermal – State of Nevada	1,248 (most likely incremental)	0

(Data from Various Public CEC Staff Reports)

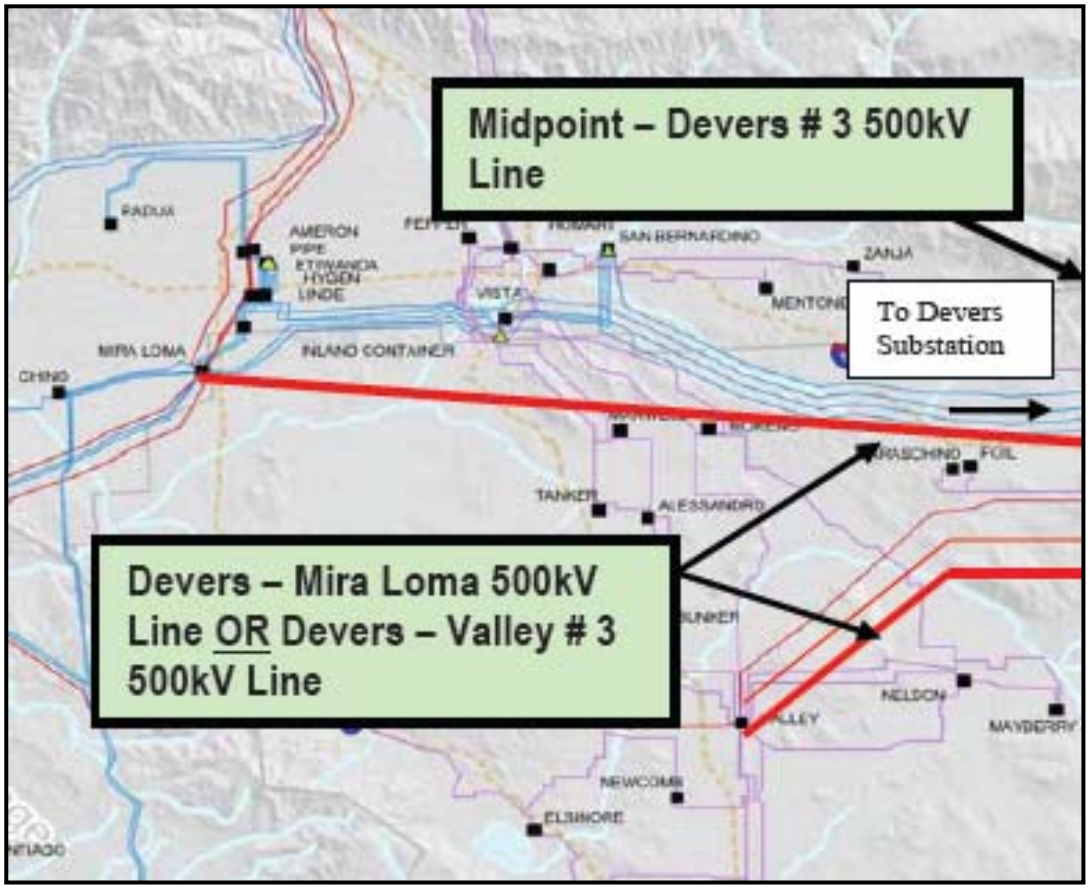
Construct New Substation and Loop Into Existing Southwest Powerlink Line



- Construct New 500kV Substation and Loop Into Existing Southwest Powerlink Line
- Connect about 1,051 MW of wind generation

Preliminary Conceptual Plan

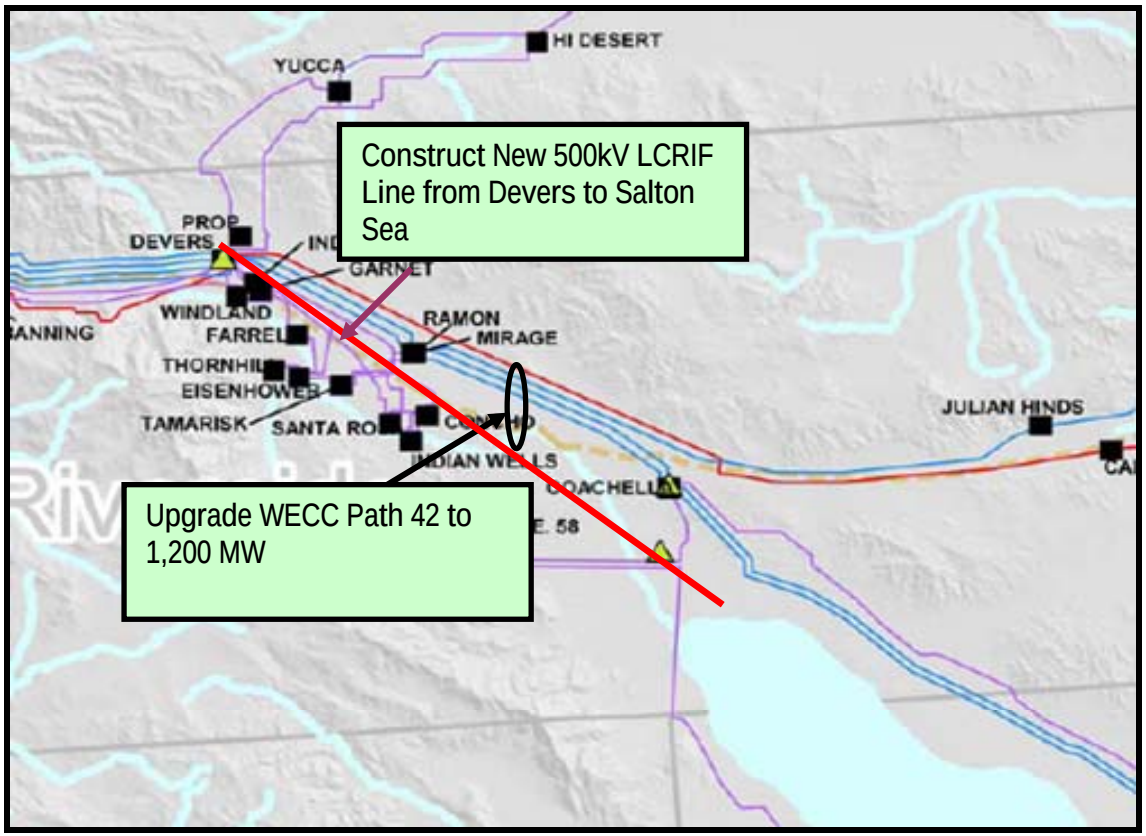
Expand Midpoint Substation and Construct Two New 500kV Lines



- Expand Midpoint Substation and Construct Third Midpoint – Devers and Devers – Mira Loma (or Valley) 500kV Line
- Connect approximately 2,400 MW solar generation and 500 MW wind generation (resource diversity that peaks at different times)

Preliminary Conceptual Plan

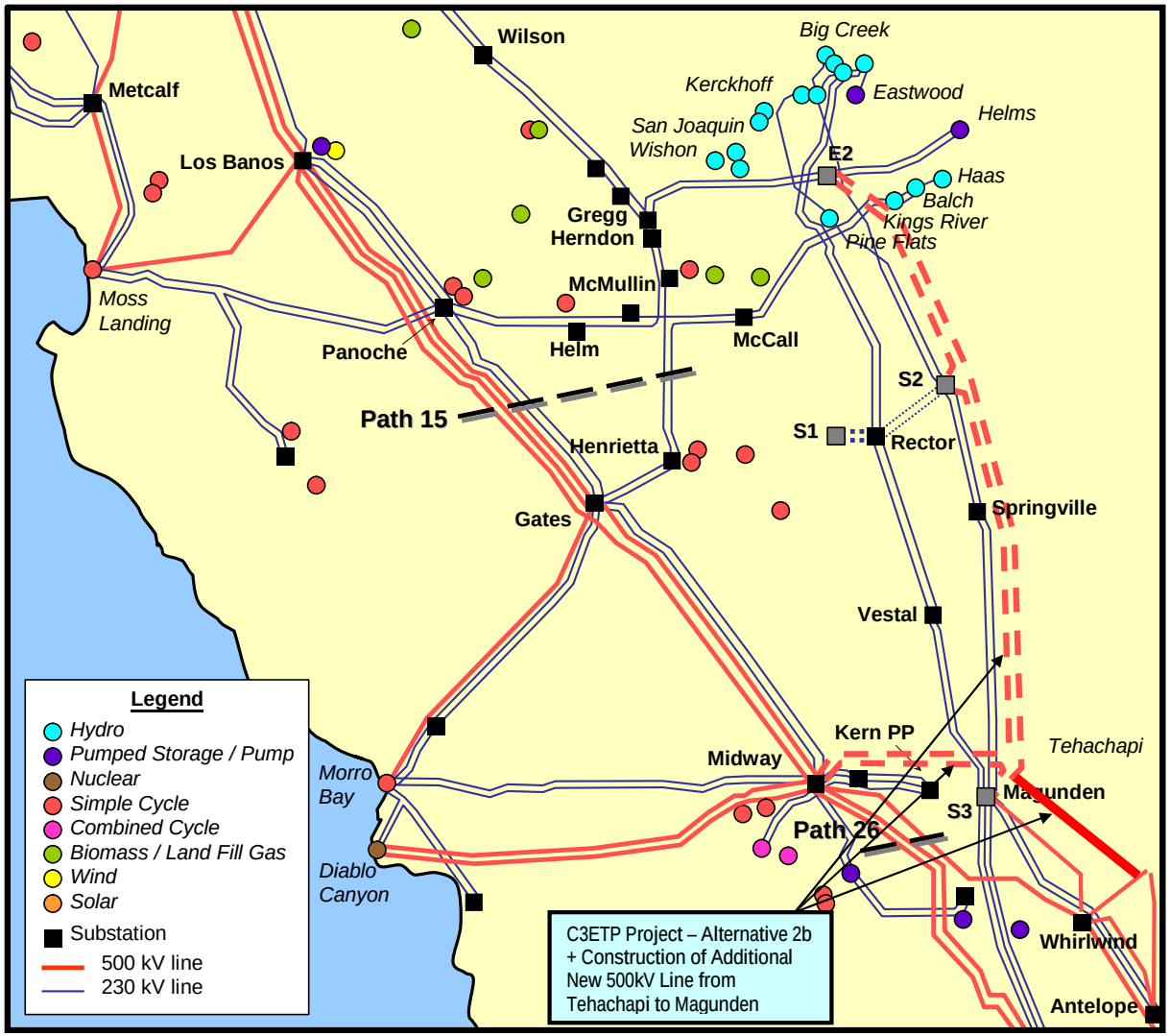
Upgrade WECC Path 42 and/or Construct New 500kV Line



- Upgrade WECC Path 42 (SCE – IID) and/or Construct New 500kV LCRIF from Salton Sea to Devers Substation
- Connect 1,800 MW geothermal generation in the Salton Sea

Preliminary Conceptual Plan

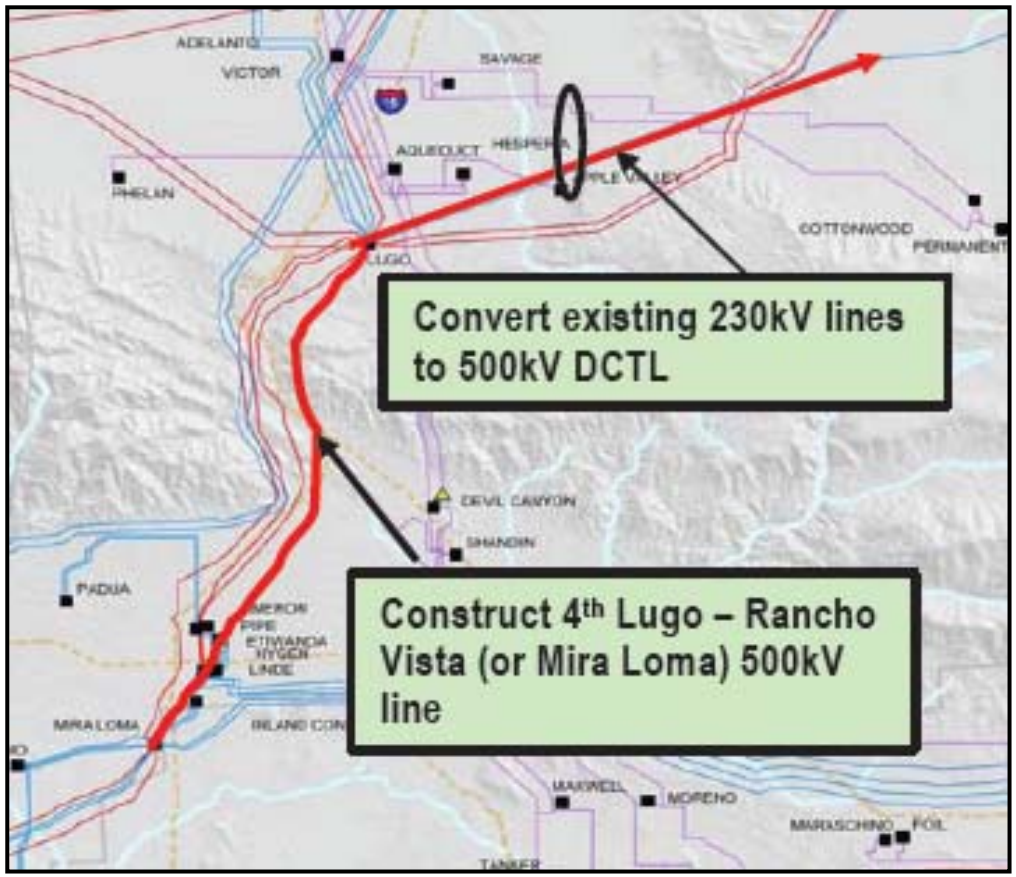
Construct Central California Clean Energy Transmission Project and New 500kV Line to Tehachapi Area



Preliminary Conceptual Plan

- Central California Clean Energy Transmission Project (C3ETP) and New 500kV Line from Tehachapi to Magunden
- Connect about 1,250 MW of wind resources in Kern County

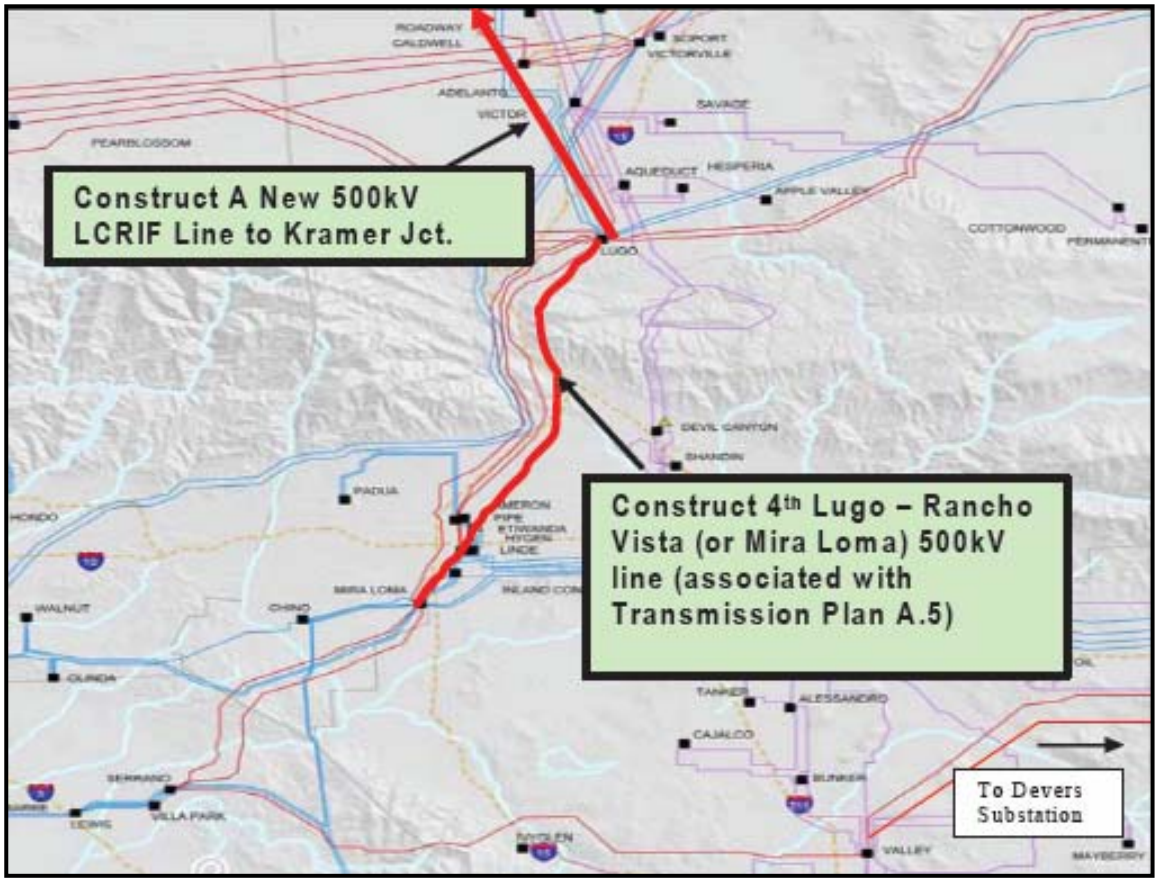
Convert 230kV Lines to 500kV Lines and Add A Fourth South of Lugo 500kV Line



- Convert Pisgah – Lugo 230kV Lines to 500kV Double Circuit Tower Line or +/- 500kV DC line
- Add a New Fourth Lugo – Rancho Vista (or Mira Loma) 500kV line
- Connect 1,200 MW of solar generation

Preliminary Conceptual Plan

Construct New 500kV Line North of Lugo Substation



- Construct New 500kV LCRIF line North of Lugo Substation
- Construct New 500kV Line to Lugo Substation (this is proposed as part of Transmission Plan on page 15)
- Connect 1,200 MW of wind generation

Preliminary Conceptual Plan